



Land Processes Distributed Active Archive (LP DAAC) Access & Interoperability

User Working Group
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Data Access: current tools

- ECHO/WIST
- Data Pool Client
- GloVIS
- MRTWeb
- In development
 - DEM Explorer
 - Reverb
- Other DAAC & Institutions
 - Oak Ridge
 - MODAPS
 - NSIDC
 - ESIP partners ('federated searches')



GloVis

“Global Visualization” Viewer

- Java-based; Data organized to support visual browsing of data (as opposed to the traditional database-driven metadata search)
- Data requires a browse image (or proxy browse); originally designed around Landsat path/row data
- Receives strong reviews from user community (particularly ASTER)
- Source code is publically available at:
<http://glovis.usgs.gov/distribution/>



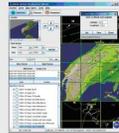
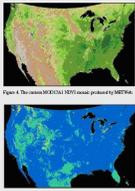
MRTWeb

“MODIS Reprojection Tool on the Web”

- LP DUE to provide subsetting, mosaiking, reprojection, and reformatting for MODIS
- Minimal development effort: Reuse/extension of GloVis and MRT
- Initial datasets limited (required MODIS data available online)
- Have had discussions with NSIDC to make the backend data services (based on MRT) available externally (MRT was initially turned into a “service” to support MRTWeb internally)
- <http://mrtweb.cr.usgs.gov/>



MRTWeb

1. SELECT	2. PROCESS	3. DOWNLOAD
<p>Use the MRTWeb Selection tab to choose MODIS Land product tiles, dates, and band of interest. Select multiple adjacent tiles of the same date to build large area mosaics, or multiple dates of the same tile to build smaller area time series.</p>  <p><small>Figure 1. An example of tile(s), mosaicing, and extracting near MODIS data for a particular area. From: MRTWeb 2.0 user interface for 2007-2008. Information on selecting the area to mosaic, the date and band of the MODIS data, and the output format is available in the original product. Access level, map layers, and the location of the output product.</small></p>	<p>Continue to the MRTWeb Process tab to specify projection, spatial subsetting, mosaicing, and output formatting options. Then click the process button to initiate your processing job on LP DAAC servers.</p>  <p><small>Figure 2. An example of specifying mosaicing options for a customer. From: MRTWeb 2.0 user interface for 2007-2008. Information on selecting the area to mosaic, the date and band of the MODIS data, and the output format is available in the original product. Access level, map layers, and the location of the output product.</small></p>	<p>The MRTWeb Download tab provides status of your processing job and an FTP-link to your output product's when complete. The original input MODIS tiles, processing logs, and processing parameters are also available for download.</p>  <p><small>Figure 3. The MRTWeb job status and download screen for the combined U.S. mosaic example.</small></p>  <p><small>Figure 4. The mosaic MODIS 1000m mosaic produced by MRTWeb.</small></p> <p><small>Figure 5. The MODIS 1000m pixel intensity values colored using the MRTWeb processing.</small></p>

- MRTWeb 2.0 released in February 2009
 - Reuse of MRT and GloVis
 - Enables users to easily and quickly select, mosaic, re-project, resample, reformat, and subset MODIS data.
 - Shares GloVis concept of “3 clicks to data”
- Statistics showing positive impact on network traffic
 - In June, nearly 9:1 ratio of input MODIS tiles to downloaded products



UWG Recommendations to date

- 2007:
 - Provide links to other land remote sensing data sources.
 - Expand visibility of alternative data access methods.
- 2008:
 - Exploit on-line archive
 - Integrated DAAC Portal to Land Data Collections
 - Multi-mission MRTWeb
 - Improved LPDAAC Access Procedures & Tools
- 2009:
 - Enable links to all relevant land process products
 - New products: expanded MRTWeb-like customization, multi-temporal packages
 - New services: combined product searches, multi-sensor discovery/delivery



Near-term Access Goals

- Cover a larger variety of land-relevant data products
 - Multi-mission (e.g., Landsat in addition to MODIS and ASTER)
- Increase understandability of search results
 - Both spatially and temporally
 - Increase capacity to visualize
- Allow for advanced delivery services
 - parameter subsetting
 - spatial subsetting
 - mosaicking
 - re-projecting
 - re-formatting



Access: User Model

- Large & heterogeneous user community
 - Many use case domains
 - Mapping, modeling, monitoring...
 - Site, landscape, region, continent, globe...
 - One-date, multi-date, long time series...
 - One parameter, one product, many products...



Student Project
Map wetland extent
Landscape scale
Summer 2009
ASTER GDEM, VNIR



Land Management
Monitor rangeland trends
Twelve sites
Last ten years and forward
MODIS Vis
Landsat 5



Science Investigation
Model ecosystem processes
North America
2005 - 2006
MODIS LST, EVI, LAI

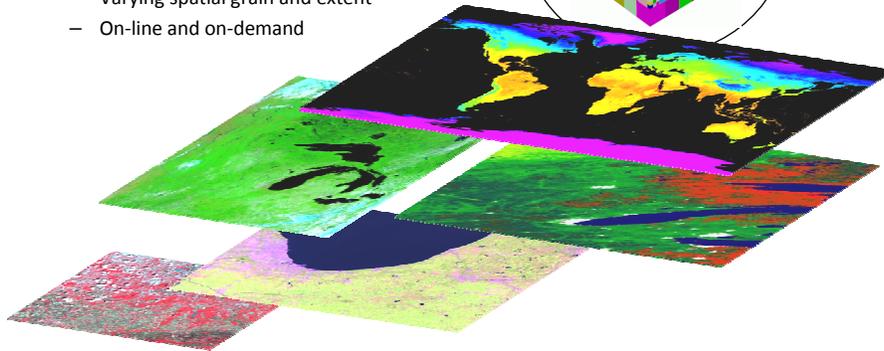
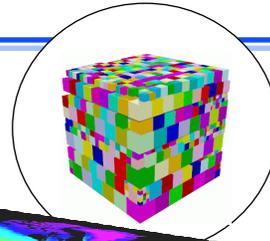


GIS Maintenance
Update mid-res database
State of Virginia
Newer than 2008
ASTER LIB
Landsat 5 & 7
<20% cloud cover

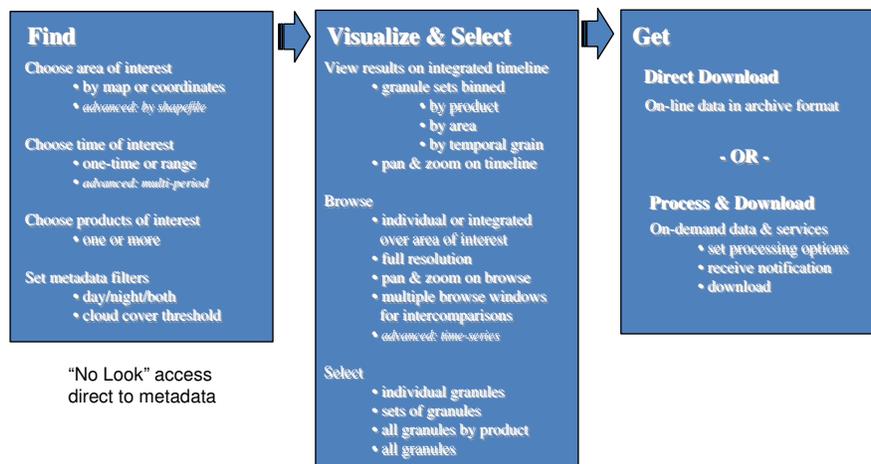


Access: Data Model

- Large & heterogeneous data archive
 - Swath, scene, tile, CMG
 - Varying parameters
 - Varying temporal grain and extent
 - Varying spatial grain and extent
 - On-line and on-demand



Task Model



Basic “look” access concepts

- Exploits on-line archive
- Multi-parameter selection
 - Multi-mission: MODIS, ASTER, Landsat, others?
 - Multi-product search & selection
- “Task flow” model derived from MRTWeb
 - Find
 - Iterative refinement through visualization & selection
 - Direct granule download and post-processing services
- Spatial & temporal visualization
- Uses open data access tools
 - OGC services, Open Layers client tools



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MRTWeb

1. SELECT
Use the MRTWeb Selection tab to choose MODIS Land product tiles, dates, and bands of interest. Select multiple adjacent tiles of the same date to build large area mosaics, or multiple dates of the same tile to build smaller area time series.

2. PROCESS
Continue to the MRTWeb Process tab to specify projection, spatial sub-sampling, re-sampling, and output formatting options. Then click the process button to initiate your processing job on LP DAAC servers.

3. DOWNLOAD
The MRTWeb Download tab provides status of your processing job and an FTP-link to your output products when complete. The original input MODIS tiles, processing logs, and processing parameters are also available for download.

Figure 1. An example of tile, band, and date selection in the MRTWeb Selection tab.

Figure 2. An example of specifying processing options in the MRTWeb Process tab.

Figure 3. The MRTWeb job status and download screen for the combined U.S. coastal waters.

- Reuse of MRT and GloVis
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NewEE

“New Earth Explorer”

- Next Generation client to support broad range of datasets at EROS (development driven by LDCM client requirements)
- What is the New Earth Explorer
 - New Earth Explorer is a web-based query, download, and request portal for holdings of remotely sensed data
- What is “New” about it?
 - New Earth Explorer is being designed to be a replacement for the current Earth Explorer interface. New Earth Explorer is a tabbed-based tool which contains new features such as browse overlay, improved searching speeds, and multi-point polygon searching
- Available for reuse (based on open source technology); look/feel customizable



The New Earth Explorer

The New Earth Explorer still has the same functionality as its predecessor, but has been based around open source code allowing it to be distributable to the public. In addition to coding changes, there has also been interface changes to improve functionality and performance. A few of these changes include:

- Full and reduced resolution browse overlay for select datasets
- Multiple-point polygon searching
- Dataset pre-filter option for defining data availability
- Tabbed interface design
- Improved search return speeds
- New metadata export options including shapefile and delimited text



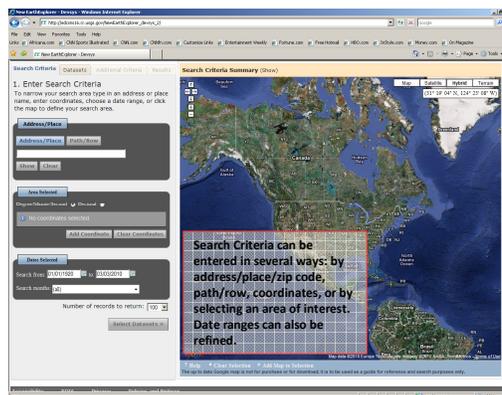
Leveraging USGS “New Earth Explorer”

New Earth Explorer

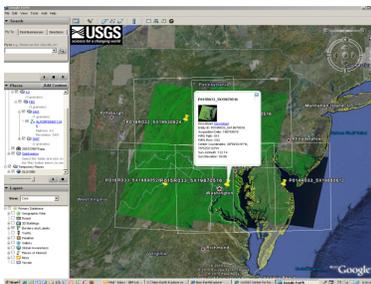
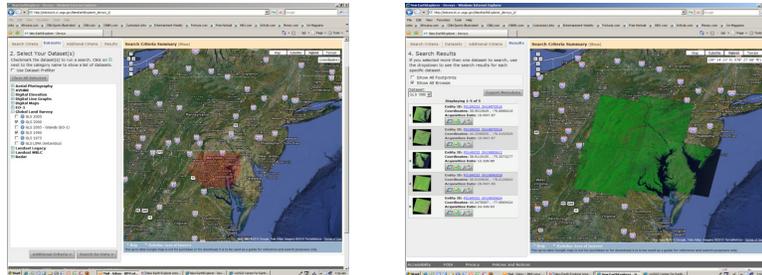
- Future LDCM data access client
- Cross-dataset search/access
- Direct download from archive
- ASTER L1B U.S. available now

New Earth Explorer 2.0 Features

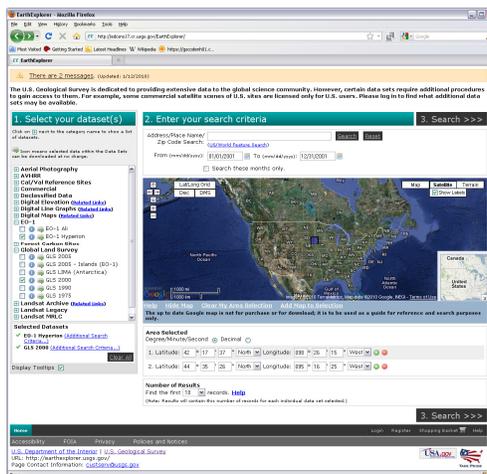
- Map viewer for viewing overlay footprints and browse overlays.
- Full Resolution Browse display capability.
- Provides KML access through Google Earth.
- User authentication service through user registration and validation routines.
- Allow multi-point polygon and point searches.
- Add on-demand products to an item selection basket.
- Supports standard product downloads.
- XML, KML, CSV, FGDC, Shape file export options.
- <http://edcsns17.cr.usgs.gov/NewEarthExplorer/>



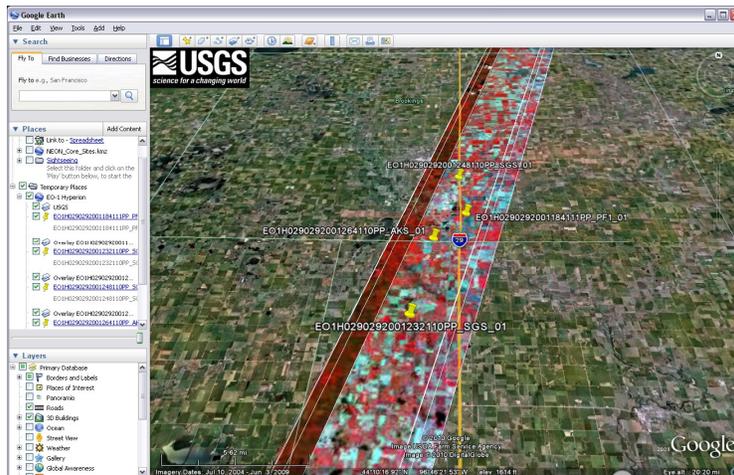
New Earth Explorer 2.0 Released Features



New EE search



New EE – KML results



Needs

- Cover variety of land-relevant data products
- Find in space/time/product envelope
- Filter by important metadata criteria (e.g., CC)
- Spatially-integrated visualization (not individual browse)
- Cross-comparative visualization (e.g., two times for one product, same time for two products)
- On-demand services (e.g., subset, mosaic, reproject, reformat)



Challenges

- Multitude of data products/types/levels
 - Scene, swath, grid, composite
 - Varying temporal and spatial grain
 - Varying period of record, but can include long time series
 - Direct access vs. on-demand products and services



Challenges

- Scaling of access problem across use case domains, e.g.:
 - Sampling – multiple small sites; one period or multiple periods
 - Mapping – best available coverage for time of interest; landscape/regional/continental/global
 - Change detection – mapping x at least 2
 - Monitoring – historical baseline + forward stream
 - All could use one to many products



ESDIS tech infusion proposals

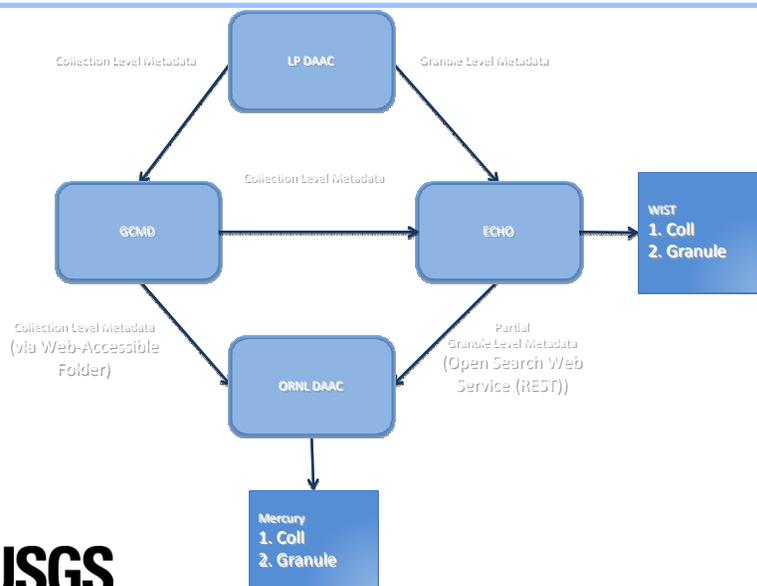
- LP DAAC – MODAPS/LAADS
 - Cross DAAC access
 - Swath data services for LP DAAC
 - Tile data services for MODAPS/LAADS
- ORNL – LP DAAC
 - Mercury ECHO Client for LP DAAC
- GES – LP DAAC (& other DAACs)
 - Simple subset wizard – spatial & variable subsets from any DAAC



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LP DAAC – ORNL DAAC Technical Infusion Project Flow of Metadata to Mercury Advanced Search Tool



Temporal search concepts

- Get Data
- Results displayed on timeline
- Select the data instance to see details
- Revise Search goes back to search parameters

The screenshot shows the LP DAAC website interface. At the top, there's a navigation menu with links like HOME, ABOUT, PRODUCTS, GET DATA, TOOLS, USER COMMUNITY, and CUSTOMER SERVICE. Below that, the page title is "LP DAAC Search & Distribution Rapid Prototype". The main content area displays search results for three data products: MOD09A1 (Surface Reflectance 8 Day Global), ASTER_L1B (Registered Radiance at Sensor), and LANDSAT_LIT. Each product has a timeline view showing data instances with their respective dates. For example, MOD09A1 has instances on 2009-08-28/17, 2009-08-31/11, and 2009-09-30/21. A "Revise Search" button is visible in the top right of the results area. At the bottom, there's contact information for the U.S. Department of the Interior, U.S. Geological Survey, and the LP DAAC website.



Temporal search concepts

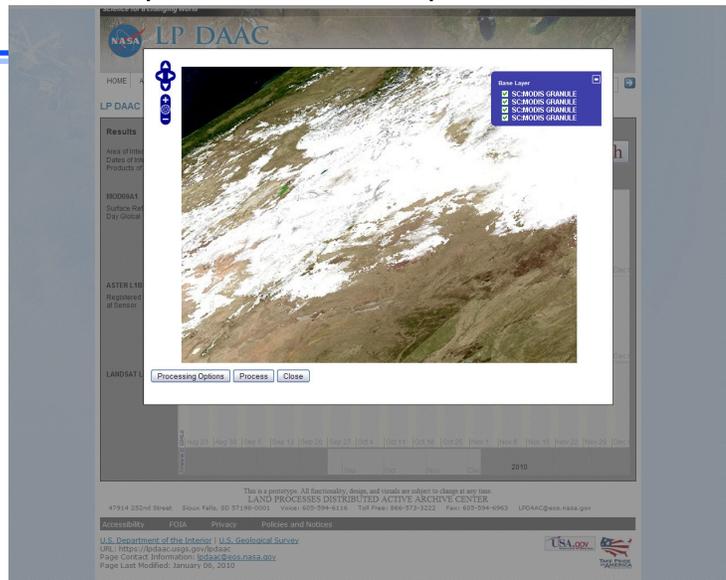
- Popup
- Shows granules for date
- Allows selecting of granules
- Can launch the browse viewer

This screenshot is similar to the first one but includes a popup window. The popup is titled "2009-09-30 / 21" and "List of Granules for this Date". It contains a list of granules for the selected date, with checkboxes next to each entry. The granules are for MOD09A1 and ASTER_L1B. At the bottom of the popup, there are "Select All" and "Browse" buttons. The background shows the same search results timeline as the first screenshot.



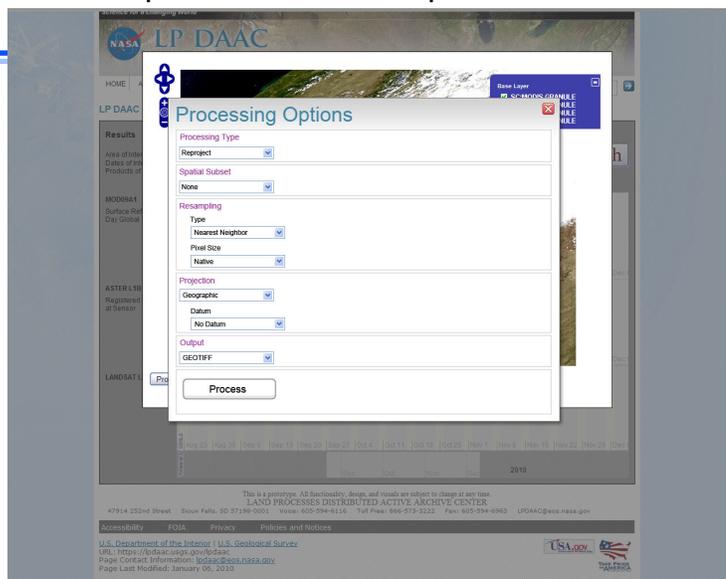
Temporal search concepts

- Browse
- Shows mosaic of selected granules
- Allows setting of order parameters
- Allows ordering
- Full resolution browse



Temporal search concepts

- Processing Options
- Select MRT parameters for this MODIS product



Temporal search concepts

- **ASTER Data**
- List of granules
- Select one or more, all
- Browse available
- Individual scene browse

The screenshot shows the LP DAAC search interface. The main results area displays three data series: MOD09A1 (Surface Reflectance 8 Day composites), ASTER L1B (Registered Radiance at Sensor), and LANDSAT LIT (Landsat Imagery). A pop-up window titled 'List of Granules for this Date' is open for the date 2009-08-13/17, showing a list of granules with checkboxes for selection. The interface includes a 'Revise Search' button and a 'Browse' button at the bottom of the pop-up.



Temporal search concepts

- **ASTER**
- Browse
- Full resolution
- Processing options button
- Process button
- Individual scene browse
- Multiple scene browse

The screenshot shows the LP DAAC search interface with a full-resolution ASTER image displayed. A 'Processing Options' dialog box is open, showing a list of processing options with checkboxes for selection. The interface includes a 'Process' button and a 'Close' button at the bottom of the dialog box.



Data Access Plan

- Upcoming LP DAAC Data Access Methods
 - Next version of “MRTWeb” (tech infusion)
 - Support for some LP DAAC external datasets
 - Some concepts from the SDRP Prototype
 - Processing Services for data selections
 - DEM Explorer
 - Visualization and ordering/subsetting/mosaicing of ASTER GDEM data
 - MEaSURES VIP Client
 - (name of Measures dataset)



ESDIS review of DAAC requirements

- **LP-3** (Conversion Services): Services made available by the DAAC via the web to do processing of DAAC data. Reprojection, mosaicing, compositing, and higher level processing could be made available on demand to users.
- **LP-2** (Temporal Data Search/Visualization): Develop a new search/access client (or enhance existing client) to enable multi-parameter, multi-product, multi-sensor, temporal searches with the results “visually” displayed on a timeline.
- **LP-5** (“View” into the Archives for Casual Users): Develop an easy-to-use interface that allows users to easily browse imagery over an area of interest (i.e., Washington D.C., Haiti) and download (up to) full resolution browse “pictures” in jpeg format of relevant DAAC data (e.g., MODIS, ASTER). This could be tied into another enhancement concept (themed groupings of data).
- **LP-1** (Enhanced Data Pool Client): A simple web interface to allow customers to find and download large chunks of the On-Line Archive, including ability to subscribe to web feed to be notified of new data.
- **LP-6** (Themed Organization of Data): Identification of potential themes such as Volcanos, Rivers, Mountain Ranges, Regions, States, Countries, Natural Disasters, etc. Make this data easily accessible via a Data Pool web interface, e.g., a system of folders containing links to EOS data. For additional value, screen granules for cloud cover and/or quality issues to leave only the most valuable data.



Use cases from UWG

- Lyle Mars – packaged, co-registered data sets from multiple sources
- Bob Brackenridge – multi-temporal products over active disturbance areas (“event” based)
- Jeff Morrisette – tools, services for decision support
- Susan Ustin – access to non-ECHO data sets
- Other – multiple instrument searches, regional mosaics, access to LANCE,



Data Access Plan

- Future (5yrs) LP DAAC Data Access Methods
 - User client integration through web based services
 - Support for selecting and processing user data at the archive through web based services
 - Search integration with many other DAACs (“federated search”)
 - Support for modeling community? (Open DAP)
 - Embrace semantic web concepts?



Discussion

- Expansions of MRTweb-like services?
- On-line archive access tools?
- “no-look” services?
- Cross-data center capabilities?
- Training/documentation?



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Standing UWG Recommendations

A.1	DAAC should enable links to access all land relevant data products, i.e. lidar, radar, ground data	access & interoperability	Integrated access through clients such as EE, glovis	Reverb is still data-center specific
A.2	DAAC data should be in GoogleEarth environments where decision makers tend to look for imagery	access & interoperability	EE will provide KML results	
A.3	ORNL and LP DAAC to collaborate on enhancing ORNL delivery tools in the context of management and modeling community needs	access & interoperability	current discussion	session at joint working group meeting?
A.4	LP DAAC should explore participation on NASA NRT UWG	access & interoperability	part of USGS non-DAAC services (eMODIS)	DAAC access tool?
A.5	Revisit rationale for not hosting EO-1 data in the DAAC	access & interoperability	available through EE, Glovis	should EO-1 metadata be made available to ECHO?
A.6	The UWG should provide guidance to the LP DAAC as to whether they pursue OpenDAP capabilities.	access & interoperability	current discussion	ESDIS encourages its use, need LP DAAC requirement
A.7	Build client that allows searches of combinations of all ECHO holdings	access & interoperability	DAAC to review based on UWG-provided scenarios	SDRP addressed the concept for EROS holdings
A.8	Embed WIST capabilities into DAAC-specific web pages.	access & interoperability	DAAC to review with R. Wolfe	
A.9	Offer a user-friendly 'seamless' mosaic/subset capability for ASTER GDEM	access & interoperability	complete with DEM Explorer	
A.10	Provide access to non-ECHO data sets relevant to land community	access & interoperability	DAAC to review based on UWG-provided scenarios	
A.11	Add 30 m data, VIIRS, LTDR, AVHRR NDVI, MEaSURES ESDRs to ORNL data delivery systems	access & interoperability	need clarification from the UWG	What are the drivers? Technology development? Inter-DAAC prototyping? User community being served?
A.12	Co-registration tool integrated with search/delivery process for multiple sensors' data	access & interoperability	DAAC to review based on UWG scenarios	Geobrain framework may already do this.
A.13	Event-based searches, perhaps using an event map to select relevant data sets (DAAC to review based on UWG-provided scenarios.)	access & interoperability	DAAC to review based on UWG scenarios	
A.14	Indication of related data sets or derived products based on user selection of products	access & interoperability	DAAC to review based on input from MODAPS, ORNL	

